

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	51	(703/21.ccls. 703/22.ccls. 703/23.ccls. 703/24.ccls. 703/25.ccls. 703/26.ccls. 703/27.ccls. 703/28.ccls.) and (717/124.ccls. 717/134.ccls. 717/135.ccls.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L2	2915	(703/21.ccls. 703/22.ccls. 703/23.ccls. 703/24.ccls. 703/25.ccls. 703/26.ccls. 703/27.ccls. 703/28.ccls. 717/124.ccls. 717/134.ccls. 717/135.ccls.)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L3	57	L2 and video adj (memory ram)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L4	1	L2 and (video adj (memory ram)) and (target adj platform)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L5	34	L2 and (target adj platform)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L6	84	L2 and "715".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L7	1	L6 and (reference adj result)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L8	6	L2 and (reference adj result)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L9	0	L2 and (known adj good adj result)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54

L10	5	L2 and (known same good same result)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L11	829	L2 and (verification verify)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L12	19	L11 and (target adj platform)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L13	2	"09/687481"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L14	7	("5313614" "5577233" "5724590" "5848274" "5943322" "5946474" "6297820").PN. OR ("6708329"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L15	19	"717".clas. and (reference adj result)	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L16	13	"716".clas. and (reference adj result)	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L17	20	"703".clas. and (reference adj result)	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L18	0	"395".clas. and (reference adj result)	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
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L20	1870	tuttle.in.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54

L21	11	tuttle.in. and regression adj testing	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L22	20	("714".clas.) and (reference adj result)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
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L25	24	("4696003" "4991176" "5038307" "5121497" "5164912" "5218605" "5388258" "5481717" "5513316" "5572727" "5657438").PN. OR ("6038378"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L26	443	"714".clas. and GUI and (verif\$8 evaluat\$5 validat\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L27	64	L26 and reference same result	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L28	1	L26 and reference adj result	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L29	63	L26 and automat\$4 same (verify verification validate validation)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L30	7	L26 and input adj event	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54

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L33	1121	(video display) adj3 (buffer memory) same (comparison validation)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L34	22	(video display) adj3 (buffer memory) same (comparison validation) and "714".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L35	499	(GUI (user adj interface)) same (evaluation debugging testing) and "714".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L36	5	(GUI (user adj interface)) same (evaluation debugging testing) same ((video display screen) adj3 (memory buffer)) and "714".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L37	9	(GUI (user adj interface)) same (evaluation debugging testing) same ((video display screen) adj3 (memory buffer)) and (emulat\$5 simulat\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L38	150	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink alternating cursor)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L39	130	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L40	0	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor) same "714". clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54

L41	0	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor) same "345". clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L42	0	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor) same "395". clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L43	1	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor) same GUI	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L44	4	((video display screen) adj3 (memory buffer)) same (evaluat\$4 compar\$5 testing validat\$4) same (blinking blink cursor) and GUI	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L45	40	((video display screen) adj3 (memory buffer)) same (blinking blink cursor) and "714".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
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L48	15	L46 and gui	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L49	10	L46 and gui not L47	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L50	9	L49 and (graphic\$5 video display screen)	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L51	30	L35 and shared adj memory	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L52	2	L35 and vram	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L53	2	L35 and video adj ram	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54

L54	9	L33 and shared adj memory	US-PGPUB; USPAT; USOCR	OR	OFF	2005/06/17 12:54
L55	2310	(screen display gui video) adj3 (test\$4 validat\$5 evaluat\$5 compar\$5) and (blink\$4 flicker\$4)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
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L57	0	(screen display gui video) adj3 (test\$4 validat\$5 evaluat\$5 compar\$5) and (blink\$4 flicker\$4) and "395".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L58	62	(screen display gui video) adj3 (test\$4 validat\$5 evaluat\$5 compar\$5) and (blink\$4 flicker\$4) and "714".clas.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L59	51	(screen display gui video) adj3 (test\$4 validat\$5 evaluat\$5 compar\$5) and ((blink\$4 flicker\$4) adj3 cursor)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
L60	2	takeda.in. and blinking adj cursor	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2005/06/17 12:54
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




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Relevance scale ☐ ☐ ☐ ☐ ☐**1 [Regression testing of database applications](#)**

Ramzi A. Haraty, Nash'at Mansour, Bassel Daou

March 2001 **Proceedings of the 2001 ACM symposium on Applied computing**Full text available: pdf(68.84 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**Keywords:** database applications, impact analysis, regression testing**2 [An empirical study of regression test application frequency](#)**

Jung-Min Kim, Adam Porter, Gregg Rothermel

June 2000 **Proceedings of the 22nd international conference on Software engineering**Full text available: pdf(332.54 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Regression testing is an expensive maintenance process used to revalidate modified software. Regression test selection (RTS) techniques try to lower the cost of regression testing by selecting and running a subset of the existing test cases. Many such techniques have been proposed and initial studies show that they can produce savings. We believe, however, that issues such as the frequency with which testing is done have a strong effect on the behavior of these techniques. Therefore, we can ...

Keywords: applicaton frequency, empirical study, regression testing**3 [Regression test selection for Java software](#)**


Mary Jean Harrold, James A. Jones, Tongyu Li, Donglin Liang, Ashish Gujarathi

October 2001 **ACM SIGPLAN Notices , Proceedings of the 16th ACM SIGPLAN conference on Object oriented programming, systems, languages, and applications**, Volume 36 Issue 11Full text available: pdf(292.35 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Regression testing is applied to modified software to provide confidence that the changed parts behave as intended and that the unchanged parts have not been adversely affected by the modifications. To reduce the cost of regression testing, test cases are selected from the test suite that was used to test the original version of the software---this process is called regression test selection. A *safe* regression-test-selection algorithm selects every test case in the test suite that may rev ...

4 An empirical study of regression test selection techniques

Todd L. Graves, Mary Jean Harrold, Jung-Min Kim, Adam Porter, Gregg Rothermel
April 2001 **ACM Transactions on Software Engineering and Methodology (TOSEM)**, Volume 10 Issue 2

Full text available:  pdf(169.73 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Regression testing is the process of validating modified software to detect whether new errors have been introduced into previously tested code and to provide confidence that modifications are correct. Since regression testing is an expensive process, researchers have proposed regression test selection techniques as a way to reduce some of this expense. These techniques attempt to reduce costs by selecting and running only a subset of the test cases in a program's existing test suite. Altho ...

Keywords: empirical study, regression testing, selective retest


5 A framework for evaluating regression test selection techniques

Gregg Rothermel, Mary Jean Harrold
May 1994 **Proceedings of the 16th international conference on Software engineering**

Full text available:  pdf(1.09 MB) Additional Information: [full citation](#), [references](#), [citations](#)

6 A safe, efficient regression test selection technique

Gregg Rothermel, Mary Jean Harrold
April 1997 **ACM Transactions on Software Engineering and Methodology (TOSEM)**, Volume 6 Issue 2

Full text available:  pdf(730.74 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Regression testing is an expensive but necessary maintenance activity performed on modified software to provide confidence that changes are correct and do not adversely affect other portions of the software. A regression test selection technique chooses, from an existing test set, the tests that are deemed necessary to validate modified software. We present a new technique for regression test selection. Our algorithms construct control flow graphs for a procedure or program and its modified version ...

Keywords: regression test selection, regression testing, selective retest

7 Practitioners report: Agile regression testing using record & playback

Gerard Meszaros
October 2003 **Companion of the 18th annual ACM SIGPLAN conference on Object-oriented programming, systems, languages, and applications**

Full text available:  pdf(267.25 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

There are times when it is not practical to hand-script automated tests for an existing system before one starts to modify it (whether to refactor it to permit automated testing or to add new functionality). In these circumstances, the use of "record & playback" testing may be a viable alternative to handwriting all the tests. This paper describes experiences using this approach and summarizes key learnings applicable to other projects.

Keywords: JUnit, XML, acceptance test, automated testing, best practices, functional test, patterns, playback, record, robot user, user interface

8 Specification-based regression test selection with risk analysis

Yanping Chen, Robert L. Probert, D. Paul Sims

September 2002 **Proceedings of the 2002 conference of the Centre for Advanced Studies on Collaborative research**

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Regression testing is essential to ensure software quality. The test team applies a regression test suite to ensure that new or modified features do not regress (make worse) existing features. Although existing research has addressed many problems and put forward solutions, most regression test techniques are *code-based*. *Code-based* regression test selection is good for unit testing, but it has a scalability problem. When the size of the subject under test grows, it becomes hard to ...

9 On test suite composition and cost-effective regression testing

Gregg Rothermel, Sebastian Elbaum, Alexey G. Malishevsky, Praveen Kallakuri, Xuemei Qiu

July 2004 **ACM Transactions on Software Engineering and Methodology (TOSEM)**, Volume 13 Issue 3

Full text available:  [pdf\(1.02 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Regression testing is an expensive testing process used to revalidate software as it evolves. Various methodologies for improving regression testing processes have been explored, but the cost-effectiveness of these methodologies has been shown to vary with characteristics of regression test suites. One such characteristic involves the way in which test inputs are composed into test cases within a test suite. This article reports the results of controlled experiments examining the effects of t ...

Keywords: Empirical studies, regression testing, test suite composition

10 Article abstracts with full text online: Testing web applications focusing on their specialties

Lei Xu, Baowen Xu, Jixiang Jiang

January 2005 **ACM SIGSOFT Software Engineering Notes**, Volume 30 Issue 1

Full text available:  [pdf\(255.38 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Nowadays, Web applications are very prevalent around the world, and it becomes more and more important to ensure their qualities by testing. However, due to the special characters of Web applications, traditional testing methods are not suitable for Web testing in many aspects. So based on the related work by now, this paper presents our research work in such areas as the Web application modeling, the test case generation, the detailed testing methods and techniques, the testing executing proces ...


Keywords: Performance Testing, Regression Testing, Testing Model, Usability

Testing, Web Application

11 Technical papers: software testing: The impact of test suite granularity on the cost-effectiveness of regression testing 

Gregg Rothermel, Sebastian Elbaum, Alexey Malishevsky, Praveen Kallakuri, Brian Davia

May 2002 **Proceedings of the 24th International Conference on Software Engineering**


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Regression testing is an expensive testing process used to validate software following modifications. The cost-effectiveness of regression testing techniques varies with characteristics of test suites. One such characteristic, test suite granularity, involves the way in which test inputs are grouped into test cases within a test suite. Various cost-benefits tradeoffs have been attributed to choices of test suite granularity, but almost no research has formally examined these tradeoffs. To address ...

12 Regression testing in an industrial environment 

Akira K. Onoma, Wei-Tek Tsal, Mustafa Poonawala, Hiroshi Suganuma

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13 Leveraging field data for impact analysis and regression testing 

Alessandro Orso, Taweesup Apiwattanapong, Mary Jean Harrold

September 2003 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering**, Volume 28 Issue 5

Full text available:  pdf(292.94 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


Software products are often released with missing functionality, errors, or incompatibilities that may result in failures, inferior performances, or user dissatisfaction. In previous work, we presented the *Gamma* approach, which facilitates remote analysis and measurement of deployed software and permits gathering of program-execution data from the field. In this paper, we investigate the use of the Gamma approach to support and improve two fundamental tasks performed by software engineers ...

Keywords: gamma technology, impact analysis, regression testing, software engineering

14 Technical papers: software testing: A history-based test prioritization technique for regression testing in resource constrained environments 

Jung-Min Kim, Adam Porter

May 2002 **Proceedings of the 24th International Conference on Software Engineering**

Full text available:  pdf(1.14 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


Regression testing is an expensive and frequently executed maintenance process used to revalidate modified software. To improve it, regression test selection (RTS) techniques strive to lower costs without overly reducing effectiveness by carefully selecting a subset of the test suite. Under certain conditions, some can even guarantee that the selected test cases perform no worse than the original test suite. But this ignores certain software development realities such as resource and time constraints ...

Keywords: empirical study, prioritization, regression testing, test history

15 Analysis and testing of Web applications

Filippo Ricca, Paolo Tonella

July 2001 **Proceedings of the 23rd International Conference on Software Engineering**

Full text available:  pdf(167.58 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



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The economic relevance of Web applications increases the importance of controlling and improving their quality. Moreover, the new available technologies for their development allow the insertion of sophisticated functions, but often leave the developers responsible for their organization and evolution. As a consequence, a high demand is emerging for methodologies and tools for quality assurance of Web based systems.


In this paper, a UML model of Web applications is proposed for their ...

Keywords: UML modeling, code analysis, reverse engineering, testing, web applications

16 A family of test adequacy criteria for database-driven applications

Gregory M. Kapfhammer, Mary Lou Soffa

September 2003 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering**, Volume 28 Issue 5

Full text available:  pdf(264.38 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Although a software application always executes within a particular environment, current testing methods have largely ignored these environmental factors. Many applications execute in an environment that contains a database. In this paper, we propose a family of test adequacy criteria that can be used to assess the quality of test suites for database-driven applications. Our test adequacy criteria use dataflow information that is associated with the entities in a relational database. Furthermore ...

Keywords: database-driven applications, test adequacy criteria

17 Using an SQL coverage measurement for testing database applications

María José Suárez-Cabal, Javier Tuya

October 2004 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 12th ACM SIGSOFT twelfth international symposium on Foundations of software engineering**, Volume 29 Issue 6


Full text available:  pdf(256.74 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Many software applications have a component based on database management systems in which information is generally handled through SQL queries embedded in the application code. When automation of software testing is mentioned in the research, this is normally associated with programs written in imperative and structured languages. However, the problem of automated software testing applied to programs that manage databases using SQL is still an open issue. This paper presents a measurement of ...

Keywords: SQL testing, database testing, software testing, statement coverage, verification and validation

18 An empirical study of regression test selection techniques

Todd L. Graves, Mary Jean Harrold, Jung-Min Kim, Adam Porter, Gregg Rothermel
April 1998 **Proceedings of the 20th international conference on Software engineering**


Full text available:  pdf(1.05 MB)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)


 [Publisher Site](#)

19 Technical papers: testing I: Improving web application testing with user session data

Sebastian Elbaum, Srikanth Karre, Gregg Rothermel
May 2003 **Proceedings of the 25th International Conference on Software Engineering**

Full text available:  pdf(1.19 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

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Web applications have become critical components of the global information infrastructure, and it is important that they be validated to ensure their reliability. Therefore, many techniques and tools for validating web applications have been created. Only a few of these techniques, however, have addressed problems of testing the functionality of web applications, and those that do have not fully considered the unique attributes of web applications. In this paper we explore the notion that user s ...

20 Regression testing of GUIs

Atif M. Memon, Mary Lou Soffa
September 2003 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering, Volume 28 Issue 5**

Full text available:  pdf(297.68 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Although graphical user interfaces (GUIs) constitute a large part of the software being developed today and are typically created using rapid prototyping, there are no effective regression testing techniques for GUIs. The needs of GUI regression testing differ from those of traditional software. When the structure of a GUI is modified, test cases from the original GUI are either reusable or unusable on the modified GUI. Since GUI test case generation is expensive, our goal is to make the unusabl ...

Keywords: GUI call-graph, GUI control-flow graph, GUI testing, call-tree,

classification of events, regression testing, repairing test cases

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1 [Automated testing of virtual reality application interfaces](#)

Allen Bierbaum, Patrick Hartling, Carolina Cruz-Neira

May 2003 **Proceedings of the workshop on Virtual environments 2003**

Full text available: pdf(601.80 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We describe a technique for supporting testing of the interaction aspect of virtual reality (VR) applications. Testing is a fundamental development practice that forms the basis of many software engineering methodologies. It is used to ensure the correct behavior of applications. Currently, there is no common pattern for automated testing of VR application interaction. We review current software engineering practices used in testing and explore how they may be applied to the specific realm of VR ...

Keywords: VR Juggler, extreme programming, unit testing

2 [Regression testing of GUIs](#)

Atif M. Memon, Mary Lou Soffa

September 2003 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering**, Volume 28 Issue 5

Full text available: pdf(297.68 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Although graphical user interfaces (GUIs) constitute a large part of the software being developed today and are typically created using rapid prototyping, there are no effective regression testing techniques for GUIs. The needs of GUI regression testing differ from those of traditional software. When the structure of a GUI is modified, test cases from the original GUI are either reusable or unusable on the modified GUI. Since GUI test case generation is expensive, our goal is to make the unusabl ...

Keywords: GUI call-graph, GUI control-flow graph, GUI testing, call-tree, classification of events, regression testing, repairing test cases

3 Practitioners report: Agile regression testing using record & playback

Gerard Meszaros

October 2003 **Companion of the 18th annual ACM SIGPLAN conference on Object-oriented programming, systems, languages, and applications**

Full text available:  [pdf\(267.25 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


There are times when it is not practical to hand-script automated tests for an existing system before one starts to modify it (whether to refactor it to permit automated testing or to add new functionality). In these circumstances, the use of "record & playback" testing may be a viable alternative to handwriting all the tests. This paper describes experiences using this approach and summarizes key learnings applicable to other projects.

Keywords: JUnit, XML, acceptance test, automated testing, best practices, functional test, patterns, playback, record, robot user, user interface

4 Extracting usability information from user interface events

David M. Hilbert, David F. Redmiles

December 2000 **ACM Computing Surveys (CSUR)**, Volume 32 Issue 4

Full text available:  [pdf\(1.50 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)


Modern window-based user interface systems generate user interface events as natural products of their normal operation. Because such events can be automatically captured and because they indicate user behavior with respect to an application's user interface, they have long been regarded as a potentially fruitful source of information regarding application usage and usability. However, because user interface events are typically voluminous and rich in detail, automated support is generally ...

Keywords: human-computer interaction, sequential data analysis, usability testing, user interface event monitoring

5 TAOS: Testing with Analysis and Oracle Support

Debra J. Richardson

August 1994 **Proceedings of the 1994 ACM SIGSOFT international symposium on Software testing and analysis**

Full text available:  [pdf\(1.49 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Few would question that software testing is a necessary activity for assuring software quality, yet the typical testing process is a human intensive activity and as such, it is unproductive, error-prone, and often inadequately done. Moreover, testing is seldom given a prominent place in software development or maintenance processes, nor is it an integral part of them. Major productivity and quality enhancements can be achieved by automating the testing process through tool development and u ...

6 Evolutionary design of complex software (EDCS) demonstration days 1999

Wayne Stidolph


January 2000 **ACM SIGSOFT Software Engineering Notes**, Volume 25 Issue 1

Full text available:  [pdf\(1.90 MB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

This report summarizes the Product/Technology demonstrations given at Defense Advanced Research Projects Agency (DARPA) Evolutionary Design of Complex Software (EDCS) Program Demonstration Days, held 28-29 June 1999 at the Sheraton National Hotel, Arlington, VA.

7 System support for pervasive applications 

Robert Grimm, Janet Davis, Eric Lemar, Adam Macbeth, Steven Swanson, Thomas Anderson, Brian Bershad, Gaetano Borriello, Steven Gribble, David Wetherall
November 2004 **ACM Transactions on Computer Systems (TOCS)**, Volume 22 Issue 4


Full text available:  pdf(1.82 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Pervasive computing provides an attractive vision for the future of computing. Computational power will be available everywhere. Mobile and stationary devices will dynamically connect and coordinate to seamlessly help people in accomplishing their tasks. For this vision to become a reality, developers must build applications that constantly adapt to a highly dynamic computing environment. To make the developers' task feasible, we present a system architecture for pervasive computing, called & ...

Keywords: Asynchronous events, checkpointing, discovery, logic/operation pattern, migration, one.world, pervasive computing, structured I/O, tuples, ubiquitous computing

8 Challenges of HCI design and implementation 

Brad Myers
January 1994 **interactions**, Volume 1 Issue 1

Full text available:  pdf(1.42 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#), [review](#)

9 The effects of information scent on visual search in the hyperbolic tree browser 

Peter Pirolli, Stuart K. Card, Mija M. Van Der Wege
March 2003 **ACM Transactions on Computer-Human Interaction (TOCHI)**, Volume 10 Issue 1

Full text available:  pdf(2.37 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The Hyperbolic Tree is a focus + context information visualization that has been developed to amplify users' ability to navigate large tree-structured information systems. Information scent is a theoretical construct that captures one kind of interaction between task and display. Information scent is provided by task-relevant display cues, such as node labels on a tree that influence a user's visual search behavior and navigation decisions. An empirical Accuracy of Scent (AOS) score was developed ...

Keywords: Hyperbolic Tree, Information visualization, fisheye-lens visual search, focus+context, information foraging, information scent, interactive computer graphics

10 Late breaking results: short papers: WebGazeAnalyzer: a system for capturing and analyzing web reading behavior using eye gaze 

David Beymer, Daniel M. Russell
April 2005 **CHI '05 extended abstracts on Human factors in computing systems**

Full text available:  [pdf\(303.67 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


Capturing and analyzing the detailed eye movements of a user while reading a web page can reveal much about the ways in which web reading occurs. The WebGazeAnalyzer system described here is a remote-camera system, requiring no invasive head-mounted apparatus, giving test subjects a normal web use experience when performing web-based tasks. While many such systems have been used in the past to collect eye gaze data, WebGazeAnalyzer brings together several techniques for efficiently collecting, a ...

Keywords: data analysis methods, eye gaze, eye tracking, gaze registration, reading detection

11 Tools and technology II: Using cursor prediction to smooth telepointer jitter

Carl Gutwin, Jeff Dyck, Jennifer Burkitt

November 2003 **Proceedings of the 2003 international ACM SIGGROUP conference on Supporting group work**

Full text available:  [pdf\(357.60 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


Telepointers are an important type of embodiment in real-time distributed groupware. Telepointers can increase the presence of remote participants and can provide considerable awareness information about people's locations and activities. However, the motion of a telepointer is often disrupted by network jitter. Although some strategies exist for dealing with jitter, none of these techniques are able to restore the immediacy and smoothness of a real cursor. In this paper we investigate the use o ...

Keywords: dead-reckoning, groupware, jitter, network delay, prediction, real-time groupware, telepointers

12 SpeechSkimmer: a system for interactively skimming recorded speech

Barry Arons

March 1997 **ACM Transactions on Computer-Human Interaction (TOCHI)**, Volume 4 Issue 1

Full text available:  [pdf\(1.03 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Listening to a speech recording is much more difficult than visually scanning a document because of the transient and temporal nature of audio. Audio recordings capture the richness of speech, yet it is difficult to directly browse the stored information. This article describes techniques for structuring, filtering, and presenting recorded speech, allowing a user to navigate and interactively find information in the audio domain. This article describes the SpeechSkimmer system for interacti ...

Keywords: audio browsing, interactive listening, nonspeech audio, speech as data, speech skimming, speech user interfaces, time compression

13 Features: From Server Room to Living Room

Jim Barton

July 2003 **Queue**, Volume 1 Issue 5

Full text available:  [pdf\(1.85 MB\)](#)  [html\(39.52 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)


The open source movement, exemplified by the growing acceptance of Linux, is finding its way not only into corporate environments but also into a home near you. For some time now, high-end applications such as software development, computer-aided design and manufacturing, and heavy computational applications have been implemented using Linux and generic PC hardware.

Now, Linux and open source software are making inroads at the other end of the computing spectrum. TiVo, the fir ...

14 System architectures for computer music

John W. Gordon

June 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 2


Full text available:  [pdf\(4.61 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Computer music is a relatively new field. While a large proportion of the public is aware of computer music in one form or another, there seems to be a need for a better understanding of its capabilities and limitations in terms of synthesis, performance, and recording hardware. This article addresses that need by surveying and discussing the architecture of existing computer music systems. System requirements vary according to what the system will be used for. Common uses for co ...

15 Automatic chunk detection in human-computer interaction

Paulo J. Santos, Albert N. Badre

June 1994 **Proceedings of the workshop on Advanced visual interfaces**

Full text available:  [pdf\(1.07 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper describes an algorithm to detect user's mental chunks by analysis of pause lengths in goal-directed human-computer interaction. Identifying and characterizing users' chunks can help in gauging the users' level of expertise. The algorithm described in this paper works with information collected by an automatic logging mechanism. Therefore, it is applicable to situations in which no human intervention is required to perform the analysis, such as adaptive interfaces. An empirical st ...

Keywords: chunk detection, chunking, event logging, human-computer interaction, models of the user, novice/expert differences, user study

16 Fast detection of communication patterns in distributed executions

Thomas Kunz, Michiel F. H. Seuren

November 1997 **Proceedings of the 1997 conference of the Centre for Advanced Studies on Collaborative research**


Full text available:  [pdf\(4.21 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Understanding distributed applications is a tedious and difficult task. Visualizations based on process-time diagrams are often used to obtain a better understanding of the execution of the application. The visualization tool we use is Poet, an event tracer developed at the University of Waterloo. However, these diagrams are often very complex and do not provide the user with the desired overview of the application. In our experience, such tools display repeated occurrences of non-trivial commun ...

17 A family of test adequacy criteria for database-driven applications

Gregory M. Kapfhammer, Mary Lou Soffa

September 2003 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering**, Volume 28 Issue 5

Full text available:  [pdf\(264.38 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


Although a software application always executes within a particular environment, current testing methods have largely ignored these environmental factors. Many applications execute in an environment that contains a database. In this paper, we propose a family of test adequacy criteria that can be used to assess the quality of test suites for database-driven applications. Our test adequacy criteria use dataflow information that is associated with the entities in a relational database. Furthermore ...

Keywords: database-driven applications, test adequacy criteria

18 Using a large projection screen as an alternative to head-mounted displays for virtual environments 

Emilee Patrick, Dennis Cosgrove, Aleksandra Slavkovic, Jennifer A. Rode, Thom Verratti, Greg Chiselko

April 2000 **Proceedings of the SIGCHI conference on Human factors in computing systems**

Full text available:  [pdf\(1.10 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Head-mounted displays for virtual environments facilitate an immersive experience that seems more real than an experience provided by a desk-top monitor [18]; however, the cost of head-mounted displays can prohibit their use. An empirical study was conducted investigating differences in spatial knowledge learned for a virtual environment presented in three viewing conditions: head-mounted display, large projection screen, and desk-top monitor. Participants in each condition were asked to repr ...

Keywords: cognitive map, experiment, field of view, head-mounted display, monitor, projection screen, spatial knowledge, virtual reality

19 Testing and debugging: A case study in class testing 

Daniel Hoffman, Paul Strooper

October 1993 **Proceedings of the 1993 conference of the Centre for Advanced Studies on Collaborative research: software engineering - Volume 1**


Full text available:  [pdf\(730.51 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

In contrast to the explosion of activity in object-oriented design and programming, little attention has been given to object testing. In our approach, a *driver* class and an *oracle* class are developed for each class-under-test (CUT). The driver class is based on a *testgraph* which partially models the CUT as a state machine, but with vastly fewer states and transitions. The oracle class provides essentially the same operations as the CUT, but supports only the testgraph state ...

20 Article abstracts with full text online: Testing web applications focusing on their specialties 

Lei Xu, Baowen Xu, Jixiang Jiang

January 2005 **ACM SIGSOFT Software Engineering Notes**, Volume 30 Issue 1

Full text available:  [pdf\(255.38 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Nowadays, Web applications are very prevalent around the world, and it becomes more and more important to ensure their qualities by testing. However, due to the special characters of Web applications, traditional testing methods are not suitable for Web testing in many aspects. So based on the related work by now, this paper presents our research work in such areas as the Web application modeling, the test case generation, the detailed testing methods and techniques, the testing executing proces ...

Keywords: Performance Testing, Regression Testing, Testing Model, Usability Testing, Web Application

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